

1 We claim:

1 1. A method to validate the configuration of a data storage and retrieval system,  
2 wherein said system comprises a host computer, one or a plurality of input/output devices, a first  
3 bus having a first maximum data transfer rate connecting said host computer to each of said one  
4 or a plurality of input/output devices, and first information comprising one or more valid system  
5 configurations, said method comprising the steps of:

6 mapping said one or a plurality of input/output devices;  
7 generating an apparent system configuration;  
8 comparing said apparent system configuration with each of said one or more valid system  
9 configurations;  
10 selecting a first valid system configuration; and  
11 configuring said data storage and retrieval system using said first valid system  
12 configuration.

1 2. The method of claim 1, wherein one or more of said one or a plurality of  
2 input/output devices comprises a multi-ported device.

1 3. The method of claim 1, wherein said first bus comprises one or a plurality of  
2 interconnections.

1 4. The method of claim 3, wherein each of said one or a plurality of interconnections  
2 is selected from the group consisting of a SCSI-1 interconnection, a SCSI-2 interconnection, a  
3 SCSI-3 interconnection, a Fibre Channel interconnection, a SCSI standard mapped over a Fibre  
4 Channel interconnection, and combinations thereof.

1 5. The method of claim 1, wherein said mapping step further comprises the steps of:  
2 querying each of said one or a plurality of input/output devices; and

receiving second information from each of said one or a plurality of input/output devices.

6. The method of claim 5, wherein said second information comprises device identify, device type, device location, and device nominal performance specifications.

7. The method of claim 1, wherein said generating step further comprises the steps of:

identifying each of said one or a plurality of input/output devices;

locating each of said one or a plurality of input/output devices; and

determining the connectivity of each of said one or a plurality of input/output devices.

8. The method of claim 1, wherein said host computer comprises a visual display device, said method further comprising the steps of:

displaying said apparent system configuration using said visual display device; and

displaying said first valid system configuration using said visual display device.

9. The method of claim 8, further comprising the step of displaying one or more error messages using said visual display device.

10. The method of claim 8, further comprising the step of displaying or more correction messages using said visual display device.

11. The method of claim 1, further comprising the steps of:

selecting a second valid system configuration;

modifying said apparent system configuration to match said second valid system configuration; and

configuring said data storage and retrieval system using said second valid system configuration.

12. A method to evaluate the performance of input/output devices and interconnecting buses disposed in a data storage and retrieval system, wherein said data storage and retrieval system comprises a host computer, one or a plurality of input/output devices, a first bus having a first maximum data transfer rate connecting said host computer to each of said one or a plurality of input/output devices, first information comprising one or more valid system configurations, and second information comprising an apparent system configuration, said method comprising the steps of:

providing third information via said first bus to one of said one or plurality of input/output devices;

receiving fourth information via said first bus from said one of said one or plurality of input/output devices;

analyzing said fourth information;

evaluating the performance of said one of said one or a plurality of input/output devices;

and

evaluating the performance of said first bus.

13. The method of claim 12, wherein said third information comprises connect commands, disconnect commands, and combinations thereof.

14. The method of claim 12, wherein said providing step further comprises providing said third information at said first maximum data transfer rate.

15. The method of claim 12, wherein said providing step further comprises providing said third information during a first time period beginning at a first time and ending at a second time.

- 1 16. The method of claim 15, wherein said first time period is about 10 seconds in  
2 duration.
- 1 17. The method of claim 15, wherein the duration of said first time period is  
2 programmable.
- 1 18. The method of claim 12, further comprising the steps of:  
2 providing said third information via said first bus to each of said one or a plurality of  
3 input/output devices; and  
4 receiving said fourth information via said first bus from each of said one or a plurality of  
5 input/output devices.
- 1 19. The method of claim 12, wherein said data retrieval system further comprises a  
2 second bus having a second maximum data transfer rate, said method further comprising the  
3 steps of:  
4 providing fifth information via said second bus to said one of said one or a plurality of  
5 input/output devices;  
6 receiving sixth information via said second bus from said one of said one or a plurality of  
7 input/output devices;  
8 analyzing said sixth information; and  
9 evaluating the performance of said second bus.
- 1 20. The method of claim 19, wherein said fifth information is selected from the group  
2 consisting of connect commands, disconnect commands, and combinations thereof.
- 1 21. The method of claim 19, wherein said fifth information is provided at said second  
2 maximum data transfer rate.

1           22.     The method of claim 19, wherein said second bus comprises one or a plurality of  
2     interconnections.

1           23.     The method of claim 22, wherein each of said one or a plurality of  
2     interconnections is selected from the group consisting of a SCSI-1 interconnection, a SCSI-2  
3     interconnection, a SCSI-3 interconnection, a Fibre Channel interconnection, a SCSI standard  
4     mapped over a Fibre Channel interconnection, and combinations thereof.

1           24.     The method of claim 19, further comprising the steps of:  
2             providing said fifth information via said second bus to each of said one or a plurality of  
3     input/output devices; and

           receiving said sixth information via said second bus from each of said one or a plurality  
of input/output devices.

           25.     The method of claim 19, wherein said fifth information is provided during a  
second time period beginning at a third time and ending at a fourth time.

           26.     The method of claim 25, wherein said second time period is about 10 seconds in  
duration.

           27.     The method of claim 25, wherein said second time period is programmable.

1           28.     The method of claim 25, wherein said first time equals said third time.

1           29.     The method of claim 28, wherein said second time equals said fourth time.

1           30.     A data storage and retrieval system comprising a computer useable medium  
2     having computer readable program code disposed therein for validating the configuration of the  
3     data storage and retrieval system, wherein said data storage and retrieval system comprises a host  
4     computer, one or a plurality of input/output devices, a first bus having a first maximum data  
5     transfer rate connecting said host computer to each of said one or a plurality of input/output

6 devices, and first information comprising one or more valid system configurations, the computer  
 7 readable program code comprising a series of computer readable program steps to effect:  
 8 mapping said one or a plurality of input/output devices;  
 9 generating an apparent system configuration;  
 10 comparing said apparent system configuration with each of said one or more valid system  
 11 configurations;  
 12 selecting a first valid system configuration; and  
 13 configuring said data storage and retrieval system using said first valid system  
 14 configuration.

31. The data storage and retrieval system of claim 30, wherein one or more of said  
 one or a plurality of input/output devices comprises a multi-ported device.

32. The data storage and retrieval system of claim 30, wherein said first bus  
 comprises one or a plurality of interconnections.

33. The data storage and retrieval system of claim 32, wherein each of said one or a  
 plurality of interconnections is selected from the group consisting of a SCSI-1 interconnection, a  
 SCSI-2 interconnection, a SCSI-3 interconnection, a Fibre Channel interconnection, a SCSI  
 standard mapped over a Fibre Channel interconnection, and combinations thereof.

34. The data storage and retrieval system of claim 30, wherein said computer readable  
 program code further comprises a series of computer readable program steps to effect:  
 querying each of said one or a plurality of input/output devices; and  
 receiving second information from each of said one or a plurality of input/output devices.

1           35.     The data storage and retrieval system of claim 34, wherein said second  
2 information comprises device identify, device type, device location, and device nominal  
3 performance specifications.

1           36.     The data storage and retrieval system of claim 30, wherein said computer readable  
2 program code further comprises a series of computer readable program steps to effect:  
3           identifying each of said one or a plurality of input/output devices;  
4           locating each of said one or a plurality of input/output devices; and  
5           determining the connectivity of each of said one or a plurality of input/output devices.

1           37.     The data storage and retrieval system of claim 30, wherein said host computer  
2 further comprises a visual display device, said computer readable program code further  
3 comprising a series of computer readable program steps to effect:

4           displaying said apparent system configuration using said visual display device; and  
5           displaying said first valid system configuration using said visual display device.

1           38.     The data storage and retrieval system of claim 37, said computer readable  
2 program code further comprising a series of computer readable program steps to effect  
3 displaying one or more error messages using said visual display device.

1           39.     The data storage and retrieval system of claim 37, said computer readable  
2 program code further comprising a series of computer readable program steps to effect  
3 displaying one or more correction messages using said visual display device.

1           40.     The data storage and retrieval system of claim 30, said computer readable  
2 program code further comprising a series of computer readable program steps to effect:  
3           selecting a second valid system configuration;

2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50

modifying said apparent system configuration to match said second valid system configuration; and  
configuring said data storage and retrieval system using said second valid system configuration.

41. A data storage and retrieval system comprising a computer useable medium having computer readable program code disposed therein for evaluating the performance of input/output devices and interconnecting buses disposed within a data storage and retrieval system, wherein said data storage and retrieval system comprises a host computer, one or a plurality of input/output devices, a first bus having a first maximum data transfer rate connecting said host computer to each of said one or a plurality of input/output devices, first information comprising one or more valid system configurations, and second information comprising an apparent system configuration, the computer readable program code comprising a series of computer readable program steps to effect:

providing to one of said one or plurality of input/output devices third information via said first bus;

receiving from said one of said one or plurality of input/output devices fourth information via said first bus;

analyzing said fourth information;

evaluating the performance of said one of said one or a plurality of input/output devices;

and

evaluating the performance of said first bus.

42. The data storage and retrieval system of claim 41, wherein said third information comprises connect commands, disconnect commands, and combinations thereof.



1           43.     The data storage and retrieval system of claim 41, wherein said computer readable  
2     program code further comprises a series of computer readable program steps to effect providing  
3     said third information at said first maximum data transfer rate.

1           44.     The data storage and retrieval system of claim 41, wherein said computer readable  
2     program code further comprises a series of computer readable program steps to effect providing  
3     said third information during a first time period beginning at a first time and ending at a second  
4     time.

1           45.     The data storage and retrieval system of claim 44, wherein said computer readable  
2     program code further comprises a series of computer readable program steps to effect adjusting  
3     the duration of said first time period to about 10 seconds.

4           46.     The data storage and retrieval system of claim 44, wherein said computer readable  
5     program code further comprises a series of computer readable program steps to effect adjusting  
6     the duration of said first time period based upon user input.

1           47.     The data storage and retrieval system of claim 41, wherein said computer readable  
2     program code further comprises a series of computer readable program steps to effect:

3                 providing said third information via said first bus to each of said one or a plurality of  
4     input/output devices; and

5                 receiving said fourth information via said first bus from each of said one or a plurality of  
6     input/output devices.

1           48.     The data storage and retrieval system of claim 41, wherein said data retrieval  
2     system further comprises a second bus having a second maximum data transfer rate, wherein said  
3     computer readable program code further comprises a series of computer readable program steps  
4     to effect:

5 providing fifth information via said second bus to said one of said one or a plurality of  
6 input/output devices;  
7 receiving sixth information via said second bus from said one of said one or a plurality of  
8 input/output devices;  
9 analyzing said sixth information; and  
10 evaluating the performance of said second bus.

1 49. The data storage and retrieval system of claim 48, wherein said fifth information  
2 is selected from the group consisting of connect commands, disconnect commands, and  
3 combinations thereof.

4 50. The data storage and retrieval system of claim 48, wherein said computer readable  
5 program code further comprises a series of computer readable program steps to effect providing  
6 said fifth information at said second maximum data transfer rate.

7 51. The data storage and retrieval system of claim 48, wherein said second bus  
8 comprises one or a plurality of interconnections.

9 52. The data storage and retrieval system of claim 51, wherein each of said one or a  
10 plurality of interconnections is selected from the group consisting of a SCSI-1 interconnection, a  
1 SCSI-2 interconnection, a SCSI-3 interconnection, a Fibre Channel interconnection, a SCSI  
2 standard mapped over a Fibre Channel interconnection, and combinations thereof.

3 53. The data storage and retrieval system of claim 48, wherein said computer readable  
4 program code further comprises a series of computer readable program steps to effect:  
5 providing said fifth information via said second bus to each of said one or a plurality of  
6 input/output devices; and

5 receiving said sixth information via said second bus from each of said one or a plurality  
6 of input/output devices.

1 54. The data storage and retrieval system of claim 48, wherein said computer readable  
2 program code further comprises a series of computer readable program steps to effect providing  
3 said fifth information during a second time period beginning at a third time and ending at a  
4 fourth time.

1 55. The data storage and retrieval system of claim 54, wherein said computer readable  
2 program code further comprises a series of computer readable program steps to adjust the  
3 duration of said second time period based upon user input.

1 56. The data storage and retrieval system of claim 54, wherein said computer readable  
2 program code further comprises a series of computer readable program steps to adjust the  
3 duration of said second time period to about 10 seconds.

1 57. The data storage and retrieval system of claim 54, wherein said first time equals  
2 said third time.

1 58. The data storage and retrieval system of claim 57, wherein said second time  
2 equals said fourth time.

1 59. A computer program product usable with a programmable computer processor  
2 having computer readable program code embodied therein for validating the configuration of a  
3 data storage and retrieval system, wherein said data storage and retrieval system comprises a host  
4 computer, one or a plurality of input/output devices, a first bus having a first maximum data  
5 transfer rate connecting said host computer to each of said one or a plurality of input/output  
6 devices, and first information comprising one or more valid system configurations, comprising:

computer readable program code which causes said programmable computer processor to map said one or a plurality of input/output devices;

computer readable program code which causes said programmable computer processor to generate an apparent system configuration;

computer readable program code which causes said programmable computer processor to compare said apparent system configuration with each of said one or more valid system configurations;

computer readable program code which causes said programmable computer processor to select a first valid system configuration; and

computer readable program code which causes said programmable computer processor to configure said data storage and retrieval system using said first valid system configuration.

60. The computer program product of claim 59, wherein said computer readable code which causes said programmable computer processor to map said one or a plurality of input/output devices additionally causes said programmable computer processor to:

query each of said one or a plurality of input/output devices; and

receive second information from each of said one or a plurality of input/output devices;

wherein said second information comprises device identify, device type, device location, and device nominal performance specifications.

61. The computer program product of claim 59, wherein said computer readable code which causes said programmable computer processor to generate an apparent system configuration additionally causes said programmable computer processor to:

identify each of said one or a plurality of input/output devices;

locate each of said one or a plurality of input/output devices; and

determine the connectivity of each of said one or a plurality of input/output devices.

62. The computer program product of claim 59, wherein said host computer comprises a visual display device, further comprising:

computer readable program code which causes said programmable computer processor to display using said visual display device said apparent system configuration; and  
computer readable program code which causes said programmable computer processor to display using said visual display device said first valid system configuration.

63. The computer program product of claim 62, further comprising computer readable program code which causes said programmable computer processor to display using said visual display device one or more error messages.

64. The computer program product of claim 62, further comprising computer readable program code which causes said programmable computer processor to display or more correction messages.

65. The computer program product of claim 59, further comprising:  
computer readable program code which causes said programmable computer processor to select a second valid system configuration; and  
computer readable program code which causes said programmable computer processor to configure said data storage and retrieval system using said second valid system configuration.

66. A computer program product usable with a programmable computer processor having computer readable program code embodied therein for evaluating the performance of input/output devices and interconnecting buses disposed within a data storage and retrieval system, wherein said data storage and retrieval system comprises a host computer, one or a plurality of input/output devices, a first bus having a first maximum data transfer rate connecting

6 said host computer to each of said one or a plurality of input/output devices, first information  
7 comprising one or more valid system configurations, and second information comprising an  
8 apparent system configuration, comprising:

9 computer readable program code which causes said programmable computer processor to  
10 provide third information via said first bus to one of said one or plurality of input/output devices;

11 computer readable program code which causes said programmable computer processor to  
12 receive fourth information via said first bus from said one of said one or plurality of input/output  
13 devices;

14 computer readable program code which causes said programmable computer processor to  
15 analyze said fourth information;

16 computer readable program code which causes said programmable computer processor to  
17 evaluate the performance of said one of said one or a plurality of input/output devices; and

18 computer readable program code which causes said programmable computer processor to  
19 evaluate the performance of said first bus;

20 wherein said third information comprises connect commands, disconnect commands, and  
21 combinations thereof.

1 67. The computer program product of claim 66, further comprising computer readable  
2 program code which causes said programmable computer processor to provide said third  
3 information at said first maximum data transfer rate.

1 68. The computer program product of claim 66, further comprising computer readable  
2 program code which causes said programmable computer processor provide said third  
3 information during a first time period beginning at a first time and ending at a second time.

69. The computer program product of claim 68, further comprising computer readable program code which causes said programmable computer processor to adjust the duration of said first time period to about 10 seconds.

70. The computer program product of claim 68, further comprising computer readable program code which causes said programmable computer processor to adjust the duration of said first time period based upon user input.

71. The computer program product of claim 66, further comprising:  
computer readable program code which causes said programmable computer processor to provide said third information via said first bus to each of said one or a plurality of input/output devices; and

computer readable program code which causes said programmable computer processor to receive said fourth information via said first bus from each of said one or a plurality of input/output devices.

72. The computer program product of claim 66, wherein said data retrieval system further comprises a second bus having a second maximum data transfer rate, further comprising:  
computer readable program code which causes said programmable computer processor to provide fifth information via said second bus to said one of said one or a plurality of input/output devices;

computer readable program code which causes said programmable computer processor to receive sixth information via said second bus from said one of said one or a plurality of input/output devices;

computer readable program code which causes said programmable computer processor to analyze said sixth information; and

11 computer readable program code which causes said programmable computer processor to  
12 evaluate the performance of said second bus;

13 wherein said fifth information is selected from the group consisting of connect  
14 commands, disconnect commands, and combinations thereof.

1 73. The computer program product of claim 72, further comprising computer readable  
2 program code which causes said programmable computer processor to provide said fifth  
3 information via said second bus at said second maximum data transfer rate.

1 74. The computer program product of claim 72, further comprising:  
2 computer readable program code which causes said programmable computer processor to  
3 provide said fifth information via said second bus to each of said one or a plurality of  
4 input/output devices; and

5 computer readable program code which causes said programmable computer processor to  
6 receive said sixth information via said second bus from each of said one or a plurality of  
7 input/output devices.

1 75. The computer program product of claim 72, further comprising computer readable  
2 program code which causes said programmable computer processor to provide said fifth  
3 information during a second time period beginning at a third time and ending at a fourth time.

1 76. The computer program product of claim 75, further comprising computer readable  
2 program code which causes said programmable computer processor to adjust the duration of said  
3 second time period based upon user input.

1 77. The computer program product of claim 75, further comprising computer readable  
2 program code which causes said programmable computer processor to adjust the duration of said  
3 second time period to about 10 seconds.



1           78.     The computer program product of claim 75, further comprising computer readable  
2     program code which causes said programmable computer processor to adjust said first time  
3     period and said second time period such that said first time equals said third time.

1           79.     The computer program product of claim 78, further comprising computer readable  
2     program code which causes said programmable computer processor to adjust said first time  
3     period and said second time period such that said second time equals said fourth time.

[illegible]